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The Maryland Fruit Grower

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THE PEACH ORCHARD OF THE FUTURE FOR MARYLAND, WITH SPECIAL REFERENCE TO PLANTING DISTANCES AND VARIETIES

By A. Lee Schrader,
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During the past 15 years several changes in peach growing practices have contributed to the development of a larger tree, requiring more space in the orchard. A change from heavy to light pruning of young trees resulted in larger and more spreading trees. Liberal use of nitrogen fertilizers has stimulated more growth of young and bearing trees, leading again to greater size of tree. Control of peach borer with paradichlorobenzene also made larger trees possible, both by preventing severe injury to tree trunks that formerly occurred and by lengthening the life of a peach tree. Other practices such as cover-cropping and peach thinning have aided in this tree development. Thus it is that growers have been confronted with a problem of greater distances of planting trees as well as the removal of trees in older plantings where trees have grown together under former planting distances.

Experiment on Planting Distances

In an effort to determine the best planting distances for peach trees, or in other words, the amount of space required for best development and fruiting of the modern tree, an experiment was laid out near Colesville, Maryland in 1927, involving 1400 trees, set out at various distances on a fertile, Chester clay loam soil. Three varieties, Hiley, Belle of Georgia, and Elberta, were set out in blocks with three rows of each variety with 28 trees per row. Four such blocks of trees were planted, one for each of the following planting distances: 24 ft. x 24 ft., 20 ft. x 24 ft., 24 ft. x 24 ft. with a filler tree in the center of each square of trees (quincunx system), and 20 ft. x 20 ft. The trees have been handled uniformly, as to culture, spraying, thinning, etc., since 1927. Yield records in bushels per tree, size of fruit, and trunk growth have been obtained during the course of the experiment. As trees became too crowded in the block under the quincunx system, the filler trees were removed leaving the remaining trees 24 ft. x 24 ft.

Although the experiment is not completed to give the relative economic returns during the life of such plantings, some interesting conclusions can be drawn at the present time, based on the data presented in the following Tables: 1, 2. and 3.

Presented at Peninsula Hort. Society Meetings, December, 1937, Camden, Delaware.

Table 1.—Effect of Planting Distances on Yields of Peach Trees in One-Half Bushels Per Tree and Per Acre.

Year	Distance of Planting. 24′ x 24′	20′ x 24′	24′ x 24′ With Filler	20′ x 20′
Hiley				
1931	4.00	3.90	3.64	3.40
1932*	2.10	1.94	1.92	1.76
1933*	2.80	2.02	1.22	0.82
1935	7.30	6.30	4.14**	.....
1936	7.86	7.24	3.84**	3.48
Totals per Tree	24.06	21.40	14.76	.....
Belle of Georgia				
1931	4.80	4.92	3.62	4.12
1932	4.54	4.16	3.72	3.66
1933	4.86	2.68	2.22	1.80
1935	6.10	4.94	3.26**	3.92
1936	5.88	4.47	3.84**	3.90
Totals per Tree	26.16	21.17	16.66	17.40
Elberta				
1931	5.60	5.38	4.04	5.64
1932	2.22	2.12	1.24	1.17
1933	4.88	4.14	1.88	1.66
1935	7.12	5.12	3.78	.....
1936	7.76	4.52	2.81	4.88
Totals per Tree	27.58	20.28	13.75	.....
Total Yields Per Acre				
Hiley	1,800	1,900	1,600	.....
Belle	2,000	1,900	2,000	1,900
Elberta	2,100	1,800	2,100	.....

* Spring frosts decreased yields in 1932 and 1933 and wiped out crop in 1934.
** Filler trees removed in spring of 1935.

The yield data in Table 1 clearly show the much greater yield per tree with greater tree spacing. The differences became much greater in the later years when trees 24′ x 24′ eventually were yielding twice as much as trees 20′ x 20′, or 24′ x 24′ with filler trees. On an acre basis, as much fruit was produced during the entire period by the 24′ x 24′ distance filler trees as with 24′ x 24′ distance with no fillers except with the Hiley variety. Since these filler trees were crowding and had to be removed from the Hiley and Belle blocks in the spring of 1935, and from the Elberta block at the end of 1936, it is evident that the remaining trees 24′ x 24′ have much smaller fruiting capacity both per tree and per acre than trees set 24′ x 24′ with no fillers, or even trees 20′ x 24′. After three years' records on Hiley and Belle of Georgia, the trees remaining after filler removal have tended to show better growth and fruiting responses, but can never catch up with trees in the other blocks. Comparing the 24′ x 24′ block, it is certain that Belle and Elberta are yielding much better per tree and slightly better per acre with the 24′ x 24′ spacing. With Hiley, the differences are not great enough to be definite, but are in the same direction on tree basis. The future fruiting of all varieties, no doubt, will be greater per tree and per acre with the greater spacing.

Table 2—Effect of Planting Distances on Size of Peach Fruits. (Belle)

Planting Distance	Percentage of Sizes* 2—2¼ in.	2¼—2½ in.	2½ in. up
24′ x 24′	10	35	55
20′ x 24′	10	50	40
24′ x 24′ with filler	25	45	30
28′ x 20′	25	50	25

* Based upon 40 to 80 bushels per plot in 1933. Other seasons showed similar differences.

Another point in favor of the greater spacing distances is found in Table 2 where it is shown that larger-sized fruits were produced by the 14′ x 24′ trees with the 20′ x 24′ trees next best. Removal of filler trees helped the size of fruit in the 24′ x 24′ filler block, which is not shown in Table 2.

Table 3—Effect of Planting Distances on Trunk Size of Peach Trees. (Trunk Circumference in Millimeters)

Variety	Year	Distance of Planting 24′ x 24′	20′ x 24′	24′ x 24′ With Filler	20′ x 20′
Hiley	Fall 1929	190	187	181	174
	Fall 1932	369	358	327	318
Belle	Fall 1929	189	185	179	183
	Fall 1932	361	337	318	366
Elberta	Fall 1929	186	183	177	183
	Fall 1932	353	346	316	328

Tree size was affected by the spacing distances and is most easily shown by trunk size, as given in Table 3. At the end of their growing season (Fall, 1929) some small differences were shown in favor of greater planting distances. However, at the end of six growing seasons (1932) quite large differences were apparent. At the present time the trees with greater planting distances are much larger with greater bearing surface and more vigorous terminal growth.

Studies are being continued on these trees.

Trends in Peach Varieties

It is felt that the peach orchard of the future will have more new and better varieties, some of them replacing the old varieties, and others filling in throughout the season with a succession of good commercial varieties. The trend in the distribution of new varieties in Maryland is shown in the results of a survey conducted in 1935, given in Table 4. The newer varieties reported in relative order of numbers includes Golden Jubilee, an early yellow of Carman season; Halberta, a late yellow variety of Hale season; Eclipse, a yellow variety between Carman and Hiley season; Halehaven, a yellow variety of Hiley season; South Haven, a yellow variety of same season as Halehaven, but not as good; July Elberta, a yellow variety of same season as Hiley; and Oriole, a yellow variety just before Carman season. This survey indicates a tendency to favor new yellow-fleshed varieties.

The ratings in column 4 of Table 4 represent the classification of peach varieties compiled by a committee of horticulturists from Experiment Stations of 12 northeastern states, recently published (1). The ratings are defined as follows:

(1) Classification and Evaluation of Varieties of Peaches Grown in the Northeastern States. The Maryland Fruit Grower. 7 (11): Nov. 1937.

Class 1. Varieties recommended for general planting in commercial orchards in any given state.

This class comprises only varieties which can be recommended for the majority of commercial orchards in any state. The list is therefore a rather limited one.

Class 2. Varieties recommended for commercial planting only in special localities, for special conditions, or by certain growers in any state.

Growers should learn the nature of the limitations of any varieties in this list and under what conditions they may have commercial merit before they make commercial plantings.

Class 3. Varieties other than those in Class 1 or 2 which may be desirable for home orchards.

A person may plant in his home garden any variety he may desire. However, it is often difficult or impossible to obtain trees true-to-name of an uncommon or little grown variety.

Class 4. Varieties which can still be purchased but are of little or no commercial value and are not recommended for planting. This does not necessarily mean that the variety is devoid of desirable characters but either that it is no longer profitable or that one or more varieties of the same season are superior.

Class 5. New varieties which appear of promising commercial value.

It can be seen that many of the old varieties are recommended for discard in Maryland. Some new varieties still need further study before commercial planting is recommended.

Conclusion

1. Fewer peach trees per acre should be planted, probably not over 75 and even less on better soils. Smaller trees on less fertile soils should not be spaced closer.

2. Distances of 24′ x 24′ or 20′ x 30′ are desirable to get large yields of larger fruits per tree and per acre for economical production with 75 trees per acre.

3. Longer lived trees of better varieties are predicted for Maryland peach orchards under present methods and developments.

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Table 4—A Partial Survey of Numbers of Peach Varieties in Maryland Orchards in 1935.

Variety	Number of Tree	Number of Growers	Rating
Elberta	27,089	39	1
J. H. Hale	7,782	26	2
Georgia Belle	7,215	29	1
Hiley	4,390	12	2
Shippers	3,485	12	2
Carman	2,744	12	4
Early Elberta	2,470	7	2
*Golden Jubilee	1,766	8	1
Brackett	1,580	9	1
*Halberta	925	10	6
Salwey	875	6	4
*Eclipse	838	4	5
Augbert	700	4	4
Red Bird	585	4	4
Late Elberta	430	4	4
Krummel	340	4	4
*South Haven	230	3	4
Fox Seedling	310	2	4
*Halehaven	200	2	5
Slappey	200	2	4
Fourth of July	200	1	--
Iron Mountain	200	1	4
Alton	175	3	4
Rochester	140	4	4
Bilyeu	120	2	4
Champion	120	4	4
*July Elberta	116	2	--
May	100	2	4
*Oriole	40	1	6
Crawford	25	1	4
Smock	25	2	--
Mikado	15	2	2

*The varieties marked with an asterisk are relatively new.

DORMANT SPRAYS

W. S. Hough, Entomologist
Winchester Research Laboratory of the Virginia Experiment Station
Winchester, Virginia

A dormant spray for apple orchards is unique in that a single application of a suitable combination of insecticides will give adequate control of several orchard pests for the entire season. For this reason the cost of controlling aphids and scale insects is not especially high compared to the cost of repeated applications required to keep the apples free from insects and diseases through the growing season.

At the present time San Jose scale is giving less concern than it has for many years. On the other hand, the white scurfy scale is rather common in many orchards in Virginia and east of the Blue Ridge the cherry scale is frequently more abundant than the San Jose scale. The cherry scale is a close relative of the San Jose scale and looks very much like it, but growers can usually distinguish cherry scale from San Jose scale by the fact that the San Jose scale causes a conspicuous red ring or spot on the apple immediately surrounding the scale, while no such red spot shows about the cherry scale or at most the red ring is comparatively inconspicuous.

It is our hope in this discussion to summarize the practical points derived

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from our experimental efforts and experiences with dormant sprays extending through the past ten years.

The trunks of apple trees and also the larger limbs on which loose bark occurs should be scraped to remove the loose bark wherever the infestation of San Jose scale or cherry scale is causing some concern. A thorough application of an effective spray will not penetrate or creep beneath the bark and often the only surviving scales will be found hidden under such protection. For a complete clean-up of these scales it is essential to remove the loose bark before spraying. Removal of the loose bark and cleaning the egg masses out of cracks, knot-holes and crevices is also essential prior to applying a dormant spray against the mealy bug which has occurred on the apple trees in an increasing number of orchards. The scrapings containing mealybug eggs should be saved and burned.

Fall spraying vs. spring spraying— According to our experience fall spraying is about as effective as spring spraying for control of San Jose, cherry and scurfy scales. For control of aphids in the egg stage it has been necessary to use the materials at greater strength in fall sprays than is required for applications made in March.

Viscosity of oil—The "flowability" of an oil appears to be important only as it is an index to volatility or rate of drying. In case of a mild to moderate infestation of San Jose scale or cherry scale there does not appear to be any important difference in our results from using an oil ranging in viscosity from 110 to 135 seconds (Saybolt) compared to a heavier oil. On the other hand, a light oil of 85 seconds viscosity has rather consistently failed to give adequate control of these scales under our orchard conditions.

Lime sulfur vs. oil for San Jose and cherry scale.— Lime sulfur at 12 gallons in 100 gallons of spray does not show as high percentage of kill as obtained from an oil spray of 2 or 3 per cent strength. But there is evidence that the surviving scales do not multiply normally through the summer and for this reason the ultimate control from lime sulfur is better than appears one month after the sprays are applied in the spring. The addition of 2 gallons of lime sulfur to dormant oil sprays appeared in some tests to increase slightly the effectiveness of the oil against San Jose and cherry scales.

Sprays for scurfy scale— The scurfy scale overwinters in the egg stage beneath the white scales which are so conspicuous on the trunk and larger limbs of an apple tree. An effective ovicide is required for controlling this stage of the insect. Petroleum oil at 4 per cent strength has been only fairly effective, because some of the emulsions used failed to deposit sufficient oil uniformly over the surface of the bark. When the trunks and branches appeared uniformly "oily" after the spray had dried, control with 4 per cent petroleum oil was fairly satisfactory, otherwise control was not adequate.

A mixture of 3 per cent petroleum oil and 2.5 per cent tar oil gave excellent control. Two per cent petroleum oil containing 9 or 10 ounces of dinitro-o-cyclohexylphenol gave satisfactory control. Likewise mixtures of 2 and 3 per cent petroleum oil and .4 per cent lauryl rhodanate gave good control; but lauryl rhodanate should not be used by growers until we learn more concerning its possible effects on fruit buds. Lime sulfur at 12 gallons in 100 gallons did not control scurfy scale.

The first brood of young crawlers of the scurfy scale hatch from the overwintering eggs early in May or about the time the apple trees near the end of their blossoming period. They crawl over the bark for a short time

then settle down and begin to form a scale of their own. In mid-summer there is a second brood of crawlers.

Excellent control of the scurfy scale was obtained in a heavily infested orchard by destroying the crawlers and young scales with applications of 2 quarts of Orthol-K oil emulsion and 4 pounds of nicotine bentonite (Black Leaf-155) per 100 gallons. The oil-nicotine combination was applied primarily for control of the codling moth on June 9, 19, 28, July 16, 24, Aug. 3 and 13.

Ovicides for aphid aggs—During the past 10 years we have been interested in the control of apple aphids by the use of dormant sprays applied as ovicides or egg-killers. Various materials have been used but only four have given effective results. All were used in combination with a dormant oil. The effective ovicides listed in order of the time of our testing are as follows:

Dinitro-o-cresol (and its sodium salt)
Tar distillates (creosote oil and water gar tar oil)
Dinitro-o-cyclohexylphenol
Lauryl rhodanate

The first named compound although effective, as indicated by the initial work in England and then by two seasons of our own tests, was replaced by the tar distillate sprays while it was still in the experimental stage. The last named compound has been used only one season under our orchard conditions and, although it appears to be effective, it cannot be recommended until further tests are made. This leaves two effective dormant sprays that are now available to Virginia growers for controlling apple aphids in the egg stage. Since the tar distillates or "tar oils" have been widely used in this state for several years, I need make no further mention of them, except to say that our results indicate that an application of 2 per cent tar oil made in late November or early December does not give consistently effective control, while the same strength applied in March has given excellent results. Tar oils at 2½ per cent strength have given excellent control whether applied in the fall or spring.

The most recently available dormant spray for aphis control consists of petroleum oil containing dinitro-o-cyclohexylphenol (Dowspray Dormant). Our results of the past two seasons with this material show that it kills aphis eggs and eggs of the scurfy scale and at the same time appears to increase slightly the effectiveness of oil against San Jose scale and cherry scale. There is no burning effect on the hands and face following the use of oil sprays containing dinitro-o-cyclohexylphenol. This material like tar oil, must be used in the dormant season and will cause serious injury to the buds if used in the delayed dormant. Fall applications were as effective as applications made in March, provided the dinitro-o-cyclohexylphenol content was not reduced much below 10 ounces per 100 gallons of diluted spray. In March we obtained excellent control of aphids with sprays containing about 7.4 ounces of dinitro-o-cyclohexyphenol per 100 gallons.

Oil injury—There is no evidence to indicate that continued use of 3 per cent petroleum oil alone or in combination with 2½ per cent tar oil causes any serious injury to apple trees. On the other hand, fruit spurs, small twigs and buds have been killed by the use of tar oil when the green first appears in the buds. Petroleum oil sprays that "layer out" in the tank, so that a few trees receive nearly all of the oil as the spray tank is emptied, have killed buds

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and small twigs. Last spring serious injury on large, vigorous apple trees followed two oil sprays. The first application in early March consisted of 3 per cent petroleum oil and 2½ per cent tar oil. The second application consisted of 3 per cent petroleum oil in late March and early April. Nearly all of the fruit buds were killed and also many leaf buds. Foliation was delayed and the trees grew abnormally small leaves through May and June.

PRUNING

It may be a little late to discuss pruning, as far as this year is concerned. In fact, some growers have done little pruning, this year, in blocks where that job was done, last year. Some growers prune only every two years, in the same blocks. Pruning is a necessary orchard practice. Its effects are not always direct, for it has relationship to the other things that the grower does; fertilization, soil management, thinning, and spraying.

In a recent article in Wisconsin Horticulture, Professor Kelley of Illinois states that to prune profitably, one must prune intelligently. Commercial pruning is a costly thing, and every cut must count for something, and should have a reason back of it. We know that pruning is a means of forming tree framework. If done properly, it allows the young trees to bear early crops. It stimulates the various parts of the tree. It is a means of avoiding weak crotches in growing trees. Weak, shading, crowded, broken, or diseased parts of the tree may be removed. Fruit thinning may be reduced somewhat by detailed pruning. If improperly done, pruning will delay bearing of young trees, reduce the crop of the tree, stunt young trees, and spoil any tree. The general procedure in pruning is to go over each tree from bottom to top, making small cuts, throughout the tree. This is the detail pruning method, and has reasons for its efficiency, based upon actual experimental and practical evidence. The ideal way is to do it every year, but finances, labor, market, and other conditions that affect the grower and the industry are the factors that should influence the degree of pruning.

HANDLING ORCHARD SOILS

A recent News-Letter of the Illinois Horticultural Society contains a statement by Dr. Richard Bradfield of Cornell University to the effect that "Plowing and cultivating land is comparable to a surgical operation on a human being—indispensable at times, but to be avoided whenever possible." This remark was made after observation of soils from virgin soils to highly cultivated ones. It was found that continued cultivation tended to compress the soil, and there was 25 to 30% more cultivated soil per cubic foot than of virgin soil. The soil particles were crammed closer together, resulting in less air and moisture content. It was also observed that the farther removed from the year the land was last in grass, the greater was the destruction by wind and water erosion.

TO WEST VIRGINIA

Through error, the name of West Virginia was omitted from the Middle Atlantic Fruit Growers' Conference write-up in the January issue of this publication. We hasten to correct this oversight. The growers and the Hor-

ticultural Society of that State were a vital factor in the formation of the Middle Atlantic Conference. Mr. H. W. Miller, Jr. was named on the Executive Committee to serve also as Director, with Messrs, E. A. Leatherman and J. Y. McDonald.

The West Virginia Horticultural Society had a fine meeting on February 2 and 3. The presence of many out-of-state growers showed that these meetings are attracting growers from far away, to hear some worth-while problems discussed.

COLD STORAGE HOLDINGS

The February 11 release of The U. S. Bureau of Agriculture Economics showed the following cold storage holdings of apples:

	Feb. 1 Av. 1933-37	Feb. 1 1937	Jan. 1 1938	Feb. 1 1938
Barrels	549,000	176,000	411,000	312,000
Western Boxes	10,767,000	9,201,000	13,952,000	10,938,000
Bushels and Eastern Boxes	7,456,000	7,631,000	16.819,000	14,202,000

IMPORTANT NOTICE

The Agricultural Insecticide and Fungicide Association has notified the Food and Drug Administration and the Public Health Service that hereafter that industry would voluntarily use a pink coloring in all white arsenical products.

The use of this coloring agent has no deleterious effect on the insecticide and will serve a very useful purpose in acting as a warning and may prevent cases of food poisoning due to carelessness on the part of the householder. Improper use of arsenicals is rare in the case of orchard and farm users, but since it does not injure the efficiency of the product it probably will be a good thing to associte a definite color with arsenical materials.

ERNEST N. CORY, *State Entomologist.*

THOSE MICE

There is no closed season for mice in the orchard. They may leave any kind of good cover crop roots, and make a meal out of a few apple tree roots. There are two kinds of mice that cause tree damage: the field mouse that may gridle at the tree collar; and the pine mouse that burrows deeply, and cleans the tree roots of all bark. Pulling the trash away from the tree base, in late fall is a help. The best control is to poison the mice by use of poison bait. This bait may be made at home or may be purchased from the Inwood Cooperative Packing Association, Inwood, W. Va. It is best used by dropping a teaspoonful in an occasional burrow around the affected trees, or by throwing a few bundles of fodder on the ground in various parts of the orchard, and placing some bait under the fodder. Growers interested in mixing of bait, may write A. F. Vierheller, College Park, Maryland for information.

The teacher was correcting Johnny for saying, "I ain't going there." "That's no way to talk. Listen: I am not going there; you are not going there; he is not going there; we are not going there; they are not going there. Do you get the idea?"

"Yes, ma'am. They ain't nobody going."

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THAT FERTILIZER QUESTION

In these days of soil conservation and improvement measures, there is lively interest in use of fertilizer.

Some growers wonder how trees can live on nitrogen fertilizer alone. The answer is that *they don't.* Practically all fertilizer experiments with fruit trees have shown that complete fertilizer seems to give no more response in growth and yield than does nitrogen alone. This, however, does not mean that the other fertilizer elements are useless. There are differences in availability, as well as in plant and soil requirements.

About the first step in fertilization is to determine whether soils need lime. Then determine, from tree growth and performance, the nitrogen needs of the tree. Apply lime or nitrogen or both, as it seems fit. As to phosphorus and potash, it seems only good farming to apply these materials to cover crop where the crop roots can take them up and use them. When these cover are mowed, disked, plowed, or naturally fall down there is a decomposition or rotting that releases the fertilizing elements and they are made available to the trees. We must depend upon organic matter from the cover crop to increase soil waterholding capacity and fertility, but soil specialists tell us that each cover crop contributes little to the permanent soil content as soil bacteria use a lot of the organic matter as "fuel" in tearing down other organic materials in the soil.

Now about this nitrogen fertilizer question. Within the past few years, it has been found that nitrogen fertilizers applied in the fall were as good as when applied in the spring. This allowed growers to use slower-acting forms of nitrogen fertilizer, with less work to worry about in the spring, and less worry about danger of affecting fruit color. Last fall, many growers did not apply any fertilizer, and there is question as to what to do, this spring. There are several plans to follow. One would be to apply nitrate of soda about the middle of March to early April. Another would be to wait until the blossoms buds are swelling, and apply nitrate of soda to each tree in amounts according to prospective bloom of the tree, using more on the heavier blooming trees. It is also possible to use two kinds of nitrogen fertilizer. Apply sulphate of ammonia as soon, now, as possible, and then use some nitrate of soda later, either at time of bloom, or after fruit set, in amounts according to the set of fruit. Cyanamide is best applied in the fall, if used to promote tree growth, but any of the nitrogen carriers may be used in spring for cover crop growth.

There is the whole question. It is up to the grower to adapt his fertilizer practices to his pocket-book, the vigor of his trees, their past treatment, and present fruiting prospects.

THE 1938 SPRAY CALENDAR

The new spray calendar has been mailed out from county agents' offices. It is in a new form which may be simpler to understand, and more convenient to tack up in the mixing shed. There are a few changes in conformance with the last Cumberland-Shenandoah Spray Conference, and spray cards will be mailed to growers at approximate times of spray applications. Growers who have not received the calendar, or who desire additional copies, should get them from their county agents, or write Department of Entomology, College Park, Md.

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THIRD. **D-X in the early foliage sprays,** at the rate of 1 pint to 100 gallons. This is the last resort and depends upon the ability of the operator to spray inside the folded leaves or reach the aphis before the foliage is curled. The D-X at this strength kills every aphis hit. It is added to the regular foliage sprays in the same way that nicotine is used, but costs ⅓ less.

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